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Marginidae, a new Afrotropical family of Diptera (Schizophora: ? Opomyzoidea)

by

David K. McAlpine
(Australian Museum, Box A285, Sydney South 2000, Australia)

ABSTRACT

The new family Marginidae is established for *Margo* gen. n., including two new species, namely *M. aperta* (Zimbabwe) and *M. clausa* (Madagascar). The family is provisionally admitted to the superfamily Opomyzoidea, though it also resembles certain Nerioidea.

Research on distribution of Marginidae is needed to determine if the populations are at risk from habitat destruction.

INTRODUCTION

It may seem surprising that two species of flies here described should be so unlike any previously known that they cannot be placed in any named family. I am, however, aware of two other undescribed acalyptrate genera (one of them also Afrotropical), each of which almost certainly will require its own new family. From this rate of discovery, it may be assumed that further new dipterous families of limited diversity and distribution await discovery.

Difficulties in determining relationships of the Marginidae arise from uncertainties regarding the limits of some schizophoran superfamilies and their groundplan characters, associated with uncertain polarities for character sequences and difficulties in identifying convergence. I have therefore not been able to employ Hennigian cladistic techniques for placing the Marginidae. However, it is apparent that this taxon has no very close affinity with any already known family, despite the small amount of material available at present.

The specialised terminology here used is largely that of Harrison (1959) and D. McAlpine (1973).

Family **Marginidae** fam. n.

Type genus: *Margo* gen. n.

The following combination of characters should distinguish the Marginidae from all other families of acalyptrate Schizophora.

Fully winged flies with unreduced mouthparts; each of 2 fronto-orbital bristles reclinate and on a separate glossy orbital zone; vibrissa weak; antenna porrect, with subapical arista; prothoracic precoxal bridge absent; mesopleural bristle present; costa unbroken, extending only to vein 3; subcosta incomplete; vein 6 not nearly reaching margin; second basal and anal cells closed or almost so; alula large, without marginal fringe; legs elongate; femora without strong bristles; male abdomen: tergite 6 and sternite 8 large; sternite 7 asymmetrically placed; hypandrium relatively simple, not of nerioid type; aedeagus rigid beyond base; female abdomen: without specialised elongate segments; cerci quite separate.

A detailed morphological description is given below for *Margo*, the only included genus.

I propose the name 'margin flies' for representatives of this family.

Genus **Margo** gen. n.

Type species: *M. aperta* sp. n.

Habitus: Very small, shining, stout flies.

Head: Rather large, produced at antennal bases and thus very angular in profile; occipital region broadly flattened, excavate above; upper postocular region very narrow in profile; ocellar triangle dull, rather narrow, attenuated anteriorly, separated on each side from lateral vertical plate by deep groove (apparently representing desclerotised cuticle) extending to occiput; sclerotised fronto-orbital plate broad, partly dull, reaching ptilinal suture anteriorly where it is setulose, with 2 separate, sharply defined glossy zones, each bearing a fronto-orbital bristle; posterior zone large and continuous with glossy lateral vertical plate, anterior zone shorter, close to eye margin; mesofrons desclerotised, without setulae; lateral arm of ptilinal suture short, extending only slightly below antennal socket; exposed part of lunule shelf-like, scarcely sclerotised, with narrow, raised sclerite on dorsomedial margin of antennal socket (similar to micropezid supra-antennal sclerite); parafacial rather broad, bare, with well defined suture; mesofacial lightly sclerotised, narrowed below, more or less emarginate medially on epistomal margin, raised into variably developed median carina along entire length; eye with sparse, very inconspicuous ommatrichia, anterior facets not enlarged; bristles present: strong inner and outer verticals, latter slightly larger and anterior to former; 2 fairly strong reclinate fronto-orbitals; ocellars inserted close together, moderately short, divergent and proclinate; cheek bristles in single series on lower margin; vibrissa usually longer than cheek bristles but quite weak; postorbital setulae numerous, rather irregular; supracervical setulae weak, in small irregular group on each side. Antenna porrect; segment 1 short, setulose; segment 2 rather short, with oblique distal surface and no dorsal longitudinal suture or sinuation, setulose, with fairly long dorsal bristle; segment 3 large, compressed; arista inserted subterminally on outer surface of segment 3 just below dorsal margin; segment 5 distinct but short; segment 6 with numerous non-seriate hairs. Palpus slender, with several fine setulae; proboscis moderately short and slender, with short labella.

Thorax: Rotund and shining, but thinly pruinescent on many parts; prothorax very short and inconspicuous; prothoracic precoxal bridge absent; probasisternum rather narrow, anteriorly tapered, bare; area between hind coxae and abdominal sternite 1 extensively membranous; scutellum rather short, convex, thick and apically rounded; subscutellum well developed, convex; wing process (Snodgrass

1935) of pteropleuron without convex ampulla (greater ampulla of J. McAlpine (1981)); bristles present: short scapular; 3 dorsocentrals well behind suture; humeral; 1 + 1 notopleurals; presutural; supra-alar; very long postalar; scutellars, consisting of large subapical pair and smaller central pair slightly further apart than subapicals; fairly strong mesopleural; one strong posterior sternopleural; bristles absent: acrostichal, intra-alar, propleural, prostigmatal, pteropleural; mesoscutum with numerous rather long non-seriate setulae not extending to notopleural region; mesopleuron setulose, particularly posteriorly below mesopleural bristle; sternopleuron setulose; hypopleuron (including metepisternum) bare. Legs conspicuously long, the fore leg least so; fore coxa with one anterior pre-apical bristle; femora without strong bristles; tibiae with hairs mostly in longitudinal series; mid tibia with one pre-apical dorsal bristle and posterodorsal series of enlarged setulae on distal part, with several small terminal ventral bristles but no well differentiated apical spur; hind tibia with weak terminal ventral spur; tarsi slender, entirely cylindrical; mid tarsus with dorsal series of closely placed, minute cuneate setulae on segments 1 and 2; hind tarsus without ventral fascicle of setulae near base. Wing rather broad, with almost uniform covering of microtrichia; costa extending to vein 3, with weak dorsal and slightly stronger ventral costagial bristle, along much of length with anterodorsal and anteroventral series of numerous fairly long setulae but no stronger bristles or spines; costa with no indication of humeral or subcostal break; other veins without setulae; humeral crossvein very oblique; subcosta distally coalescing with vein 1 well before end of latter, slightly weakened before junction; vein 1 distally thickened; veins 2 and 3 divergent throughout their lengths; distal section of vein 4 largely desclerotised, distinguishable as a concave crease in membrane with linear series of microtrichia; second basal cell moderately short, closed by almost transverse basal crossvein; anal crossvein rather oblique in part, curved basally and weakened posteriorly; vein 6 weakened adjacent to anal cell, its distal section sclerotised, extending no more than halfway from anal cell to margin; vein 7 not visible beyond alula; alula well developed, without marginal fringe; axillary lobe (upper calypter) inconspicuous, margin with short setulae on inner part and longer setulae on slight prominence near alula. Haltere with sharply defined, broadly ovoid capitellum.

Abdomen: Short and broad; tergites 1 and 2 fused, but weak, flexible line of fusion present; tergites 2–6 with numerous coarse setulae; details of male postabdomen given under description of *M. aperta*, those of female postabdomen under *M. clausa*.

Etymology: L. *margo* (genitive *marginis*)—a margin. Refers to the infuscated costal margin of the wing. Feminine.

Key to species of *Margo*

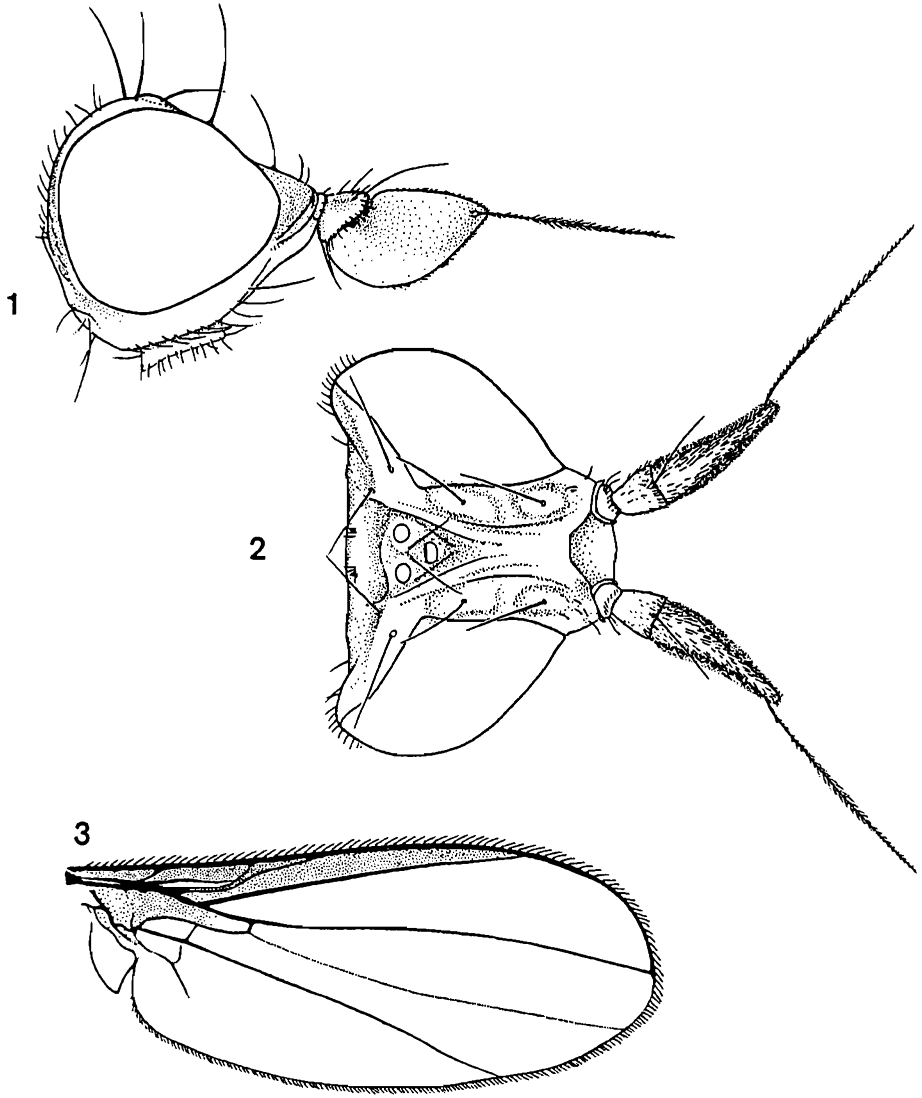
1 Palpus yellowish; discal cell open distally; capitellum of haltere largely black [Zimbabwe] .... **aperta** sp. n.
— Palpus black; discal cell closed; haltere yellow; [Madagascar] . **clausa** sp. n.

Margo aperta sp. n.

Figs 1–6

Description: Based on male (female unknown).

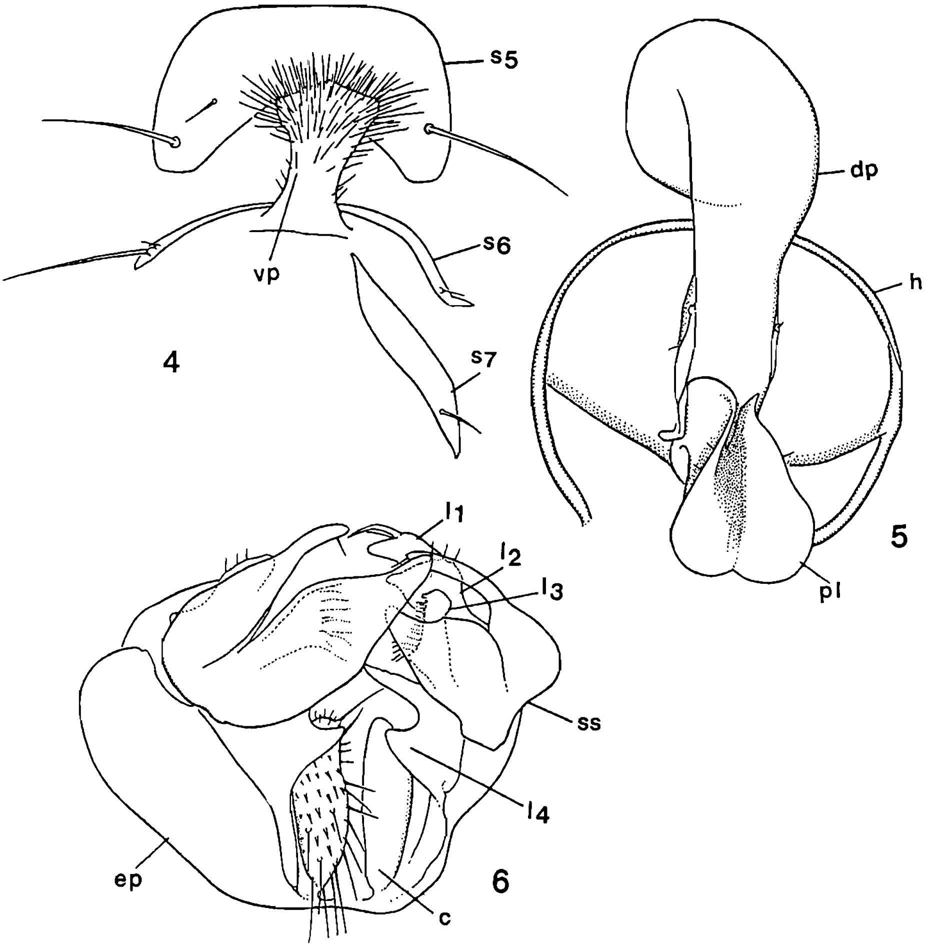
Coloration: Generally deep brown (probably darker in fresh material); major bristles of head and thorax black; anterior extremity of mesofrons yellowish brown; lunule, face and cheek pale fulvous; parafacial with silvery pruinescence. Antenna brown, with ventral part of segment 3 fulvous. Prelabrum pale brown;



Figs 1–3. *Margo aperta* sp. n. 1–2. Head. 3. Wing.

palpus and proboscis tawny. Coxae and femora brown; mid and hind femora darker; tibiae and tarsi pale yellowish, the former slightly browned at bases. Wing hyaline with costal, subcostal, marginal and part of first basal cells infuscated. Haltere brown, with much of capitellum blackish. Abdomen brown-black.

Head (Figs 1–2): Strongly produced at antennal bases; anterior glossy fronto-orbital zone elongate, ovate; face, at narrowest part, much narrower than parafacial at same level; eye almost as high as long; vibrissa inserted well above level of lower facial margin. Antennal segment 3 elongate-ovate, tapering distally; arista much less than twice length of segment 3. Palpus small, not reaching anterior end of prelabrum.



Figs 4–6. *Margo aperta* sp. n., male postabdomen. 4. Proandrial sternites. 5. Hypandrium with aedeagus. 6. Terminal oblique view of epandrium (setulae on epandrium and left cercus omitted). Abbreviations: c, cercus; cp, clavate process of segment 6; dp, distiphallus; ep, epandrium; h, hypandrium; 11–14, paired lobes of epandrium; pl, posterior lobe of distiphallus; s5–s7, sternites 5–7; ss, surstylus; vp, ventral process of segment 6.

Thorax: Presutural bristle rather short; 3 dorsocentral bristles, anterior one very variable in length. Wing (Fig. 3): vein 4 visible to wing margin as an unpigmented crease; discal cell open distally; alula acute.

Abdomen (Figs 4–6): Tergites 2–6 broad, well sclerotised; tergite 6 shorter than preceding tergites; sternites 4 and 5 each with one pair of large and one of small setulae; sternite 5 broadly sinuate on posterior margin; sternite 6 narrowly transverse, with one large setula near right extremity and a minute setula near each end; segment 6 ventrally with median, anteriorly directed, flattened, clavate process with long-pubescent apex, arising from just behind sternite; sternite 7 rather small, isolated, displaced to left side, with one setula; sternite 8 bare, convex, extensively setulose, asymmetrical; epandrium extensively setulose; surstylus freely moveable, deeply bilobed; 4 pairs of lobes of diverse shape and armature arising from inner margin of epandrium; hypandrium rather flat, with thickened margins, forming a three-quarter circle connected posteriorly to anterior angles of epandrium, and with broad, sclerotised anterior plate; aedeagus with large, clavate, heavily sclerotised and pigmented distiphallus, with bulbous reflexed apex, and soft, channelled, slightly emarginate posterior lobe; cerci separate, setulose and microtrichose.

Dimensions: Total length 1,7–1,9 mm; length of thorax 0,8–1,0 mm; length of wing 2,2–2,3 mm.

Distribution: Eastern Zimbabwe.

Material examined: Holotype ♂: ZIMBABWE: Chirinda Forest, near Mt. Selinda, 25.i.1955, B. R. S & P. G. [B.R. & P. Stuckenberg] (Natal Museum; NM Type No. 373); 2 ♂ Paratypes, same data (Natal Museum; Australian Museum).

Etymology: L. *apertus*—open. Refers to the open discal cell of this species.

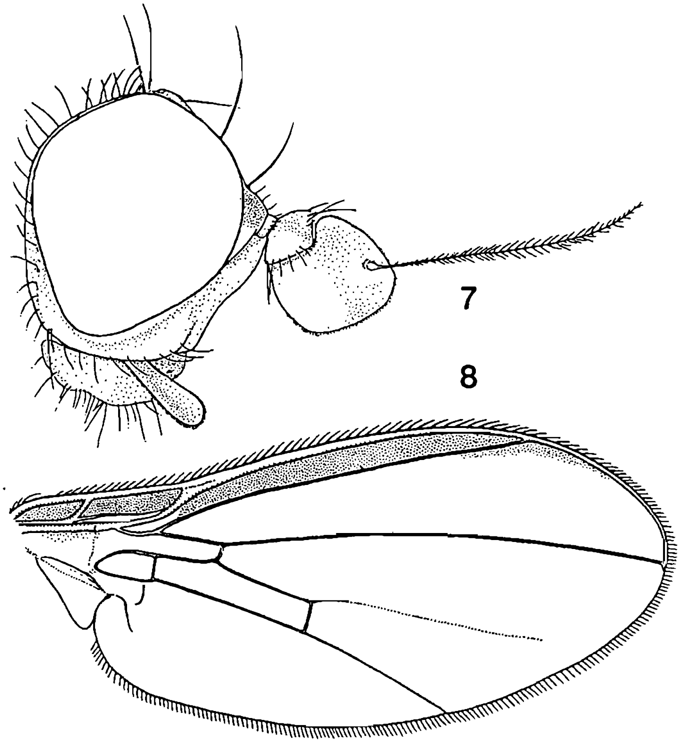
Margo clausa sp. n.

Figs 7–8

Description: Based on female (male unknown).

Coloration: Generally black, including major bristles and most setulae; anterior extremity of mesofrons yellow; lunule, face, cheek and proboscis creamy. Ventral parts of antennal segments 2 and 3 pale fulvous. Palpus black. Legs generally pale fulvous; fore coxa creamy; mid coxa partly brown; mid femur largely dark brown, pale fulvous at extreme base, with yellowish brown pre-apical zone; hind femur similar but basally much more extensively pale; mid and hind tibiae brown basally; fore tarsus with 2 apical segments brown, those of mid and hind tarsi paler brown. Wing with costal infuscation extending into submarginal cell; first basal cell without infuscation. Haltere yellow.

Head (Fig. 7): Less strongly produced at antennal bases and less acutely angular in profile than in *M. aperta*; anterior glossy fronto-orbital zone very short; face much broader than parafacial throughout, less strongly raised medially than in *M. aperta*; eye slightly higher than long; vibrissa inserted near lower facial



Figs 7–8. *Margo clausa* sp. n. 7. Head. 8. Wing.

margin. Antennal segment 3 short-ovate, broadly rounded distally; arista about twice as long as segment 3. Palpus long, reaching far in front of prelabrum.

Thorax: Presutural bristle larger than in *M. aperta*; 2 long, unequal dorsocentral bristles, also sometimes a distinct setula in front of anterior one (present on one side only in holotype). Wing (Fig. 8): distal section of vein 4 not reaching margin; discal cell closed; anal crossvein weaker and less complete than in *M. aperta*; distal section of vein 6 shorter; alula obtuse.

Abdomen: Segments 1–5 as in male of *M. aperta* (sternites not visible); tergites 6 and 7 broad and apparently short, setulose; tergite 8 and epiproct small, weakly setulose, apparently not longer than wide; cerci separate, broadly rounded, with some setulae rather long and sinuous.

Dimensions: Total length 1,9 mm; length of thorax 1,1 mm; length of wing 2,6 mm.

Distribution: Central eastern Madagascar.

Material examined: Holotype ♀ (unique): MADAGASCAR: Ranomafana, c. 21°S:47°E, 31.x—3.xi.1987, S. F. McEvey & S. Aulard (National Museum of Natural History, Paris). Note: The type locality is on the road leading northwest from the coastal town of Manakara (there are at least 2 other places called Ranomafana in eastern Madagascar).

Etymology: L. *clausus*—closed. Refers to the discal cell.

RELATIONSHIPS

The morphology of the Marginidae combines a range of features which appear highly contradictory as indicators of relationships to other taxa of Schizophora. My first impression of the insect suggested it to be a representative of the superfamily Nerioidea (Micropezoidea), combining features of several families, particularly Pseudopomyzidae and Neriidae. Characters shared with Neriidae (and to some extent with Pseudopomyzidae) include: head capsule angularly produced anteriorly, with frontal shelf between antennal bases and supra-antennal sclerite above each antennal socket; antenna porrect with subterminal arista; mesofrons soft, lacking setulae, contrasting with strongly sclerotised orbital plates; face tending towards median desclerotisation; probasisternum of typical nerioid shape; lateral scutellar bristle shortened; vein 7 not extending beyond alula; legs remarkably long; tibiae with seriate hairs; tarsi cylindrical, with seriate setulae. Some other features are more typical of Pseudopomyzidae than Neriidae, *viz.* the more rounded thorax with distinct humeral and presutural bristles, and the reduced subcosta.

Notable features of *Margo* which differ from both Pseudopomyzidae and Neriidae include: outer vertical anterior to inner vertical; subscutellum prominently developed; apicoventral bristle of mid tibia much reduced; vein 4 distally obsolescent.

The Nerioidea *s.s.* (families Cypselosomatidae, Pseudopomyzidae, Neriidae and Micropezidae) have distinctive autapomorphic conditions of both male and female postabdomens. Significant features of the male include: a very elongate basiphallus on a reduced hypandrium, supported by usually 2 pairs of longitudinal sclerotised rods, with a pair of pre-apical processes, a terminal, anteriorly directed distiphallus, and usually a rigid anterior, unpaired process in the angle at the junction of the basiphallus and distiphallus (see Hennig 1958, Fig. 20; D. McAlpine 1966, Fig. 1d; and, for some variants, Hennig 1969, Figs 7–14); epandrium (except in Micropezidae) elongate and ventrally channelled to receive the basiphallus, with the cerci and articulated surstyli terminal. I note that the above morphological interpretation differs from that of J. McAlpine (1989: 1430), but this scarcely affects the present argument. Also, the Nerioidea consistently have (as stated by J. McAlpine 1989) "sternite 7 and tergite 7 of female lengthened and fused to form a bulbous ovipositor base (oviscape)". *Margo* totally lacks these autapomophies of the Nerioidea *s.s.* (or perhaps partly of Nerioidea minus the Micropezidae), and seems to have the morphology of the postabdomen of both sexes in a more plesiomorphic state. It appears, then, that it cannot be referable to Nerioidea *s.s.* It is not particularly probable that the Marginidae form a closely related outgroup to Nerioidea (as I believe the Megamerinidae and Tanypezidae may, despite their different placement in recent classifications). The Marginidae show resemblance to one or two particular nerioid families, as shown above, and if this resemblance is due to convergence, the case for placement in or near Nerioidea is largely negated.

Margo shows some resemblance to the family Chamaemyiidae (superfamily Sciomyzoidea, or Lauxanioidea in those classifications which give the latter separate status), particularly the genus *Acrometopia* Schiner. *Acrometopia* (as with most chamaemyiids) differs in its sub-basal arista with enlarged segment 5, uniformly sclerotised face, lack of supra-antennal sclerite, larger and more anteriorly placed lateral scutellar bristles, smaller subscutellum, absence of mesopleural bristle, presence of posterior intra-alar bristle, broad prosternum, quite short femora, apically distinct subcosta, visible but desclerotised distal section of vein 7, deep sinuosity in margin of alula near base of alular incision, and presence of alular fringe. A close relationship between the Marginidae and the Chamaemyiidae or any other taxa of Sciomyzoidea is unlikely.

The family Heleomyzidae (*s.l.* as delimited by D. McAlpine (1985)) includes such a large range of variation that some comparison with Marginidae must be made. *Margo* differs from almost all heleomyzids in its unbroken costa, absence of differentiated bristles on the femora, absence of any distinct apical ventral spur on the mid tibia, the subapical arista, the reduced vein 4, and the weakening of vein 6 on the anal cell. It is conceivable that some of these traits, particularly the last three, could have evolved in the very wide diversification of the Heleomyzidae, but the acquisition of all six in one lineage seems beyond reasonable probability. The other families of the superfamily Heleomyzoidea (Sphaeroceroidea), *viz.* Sphaeroceridae and Chyromyidae, are highly derived and not morphologically close to the Marginidae.

The only other schizophoran families which seem possibly related to the Marginidae are some of the Opomyzoidea (in a revised sense), particularly the Clusiidae and Acartophthalmidae (other included families being Opomyzidae, Odiniidae, Agromyzidae, Fergusoninidae, Xenasteiidae, Carnidae). The following rather indefinite characterisation of the Opomyzoidea is derived mainly from Colless & McAlpine (in press): postvertical bristles, when present, generally divergent to parallel; one or more strong fronto-orbital bristles, but no proclinate one; arista never plumose (bipectinate); antennal segment 2 without dorsal slit; prosternum usually compact, without precoxal bridges; costa broken at end of Sc (except in Acartophthalmidae and Fergusoninidae); Sc not much diverging from vein 1 distally (except in Acartophthalmidae); second basal and anal cells more or less complete; vein 6 usually interrupted near middle of anal cell, sclerotised for a variable distance beyond anal cell; vein 7 absent beyond alula; protandrium often asymmetrical; female postabdominal segments often elongate and with cerci fused or joined by membrane.

The porrect antenna of Marginidae somewhat resembles that of Acartophthalmidae and some Clusiidae, segment 2 being particularly like that of the former in *Margo aperta*; in *M. clausa*, which probably has more plesiomorphic antennal proportions, segment 2 has a slight angular extension on the distal margin of the outer side, very like that of Opomyzidae (eg. *Opomyza* Fallén) and less prominent than that of most Clusiidae; the supra-antennal sclerite resembles that of Clusiidae and Opomyzidae; the lack of the subcostal break of the costa and costal chaeotaxy are similar to Acartophthalmidae; reduction of the subcosta is characteristic of opomyzoid families other than Clusiidae and Acartophthalmidae, while reduction of vein 7 is shared with all opomyzoids; the thoracic chaetotaxy is rather similar to that of Acartophthalmidae and to some extent of Clusiidae, Opomyzidae, and Agromyzidae, notably in the presence of a strong mesopleural bristle. The facial structure is variable in the Opomyzoidea. In the Clusiidae the face (mesofacial) is broad and desclerotised, without a defined epistomal margin. In the Opomyzidae and Acartophthalmidae the face is similarly desclerotised but is much narrowed by encroachment of the parafacials, which form broad, somewhat concave plates below the antennae. The face of Marginidae, as described above, differs from all the latter families, but shows a resemblance in that it is medially somewhat desclerotised. The male postabdomen of Marginidae has a general, but not detailed resemblance to that of Clusiidae.

The following characters of Marginidae contrast either with the Opomyzoidea as a whole, or more particularly with Opomyzidae, Clusiidae and Acartophthalmidae: ocellar triangle separated from vertical plate on each side by a groove; mesofrons soft, lacking setulae; lateral arm of ptilinal suture short; outer vertical bristle anterior to inner; thorax rotund; subscutellum prominently convex (tachinid-like); mid tibia without well differentiated apicoventral spur; male postabdomen with symmetrically placed sternite 6; female postabdomen with tergites all short and broad, and cerci short, broad and well separated.

In conclusion then, the relationships of the Marginidae are unclear, there being no unambiguous synapomorphies with any other schizophoran family or group of families. I provisionally place it in the superfamily Opomyzoidea because of variable degrees of resemblance to several of the included families, and because of apparent lack of significant resemblance to other schizophoran superfamilies.

HABITAT AND ECOLOGICAL STATUS

Both species of *Margo* were collected in wet forests. As with other wet-forest schizophoran flies (eg. Clusiidae), forest clearing or degradation would probably threaten their survival, and it is likely that this process has already restricted their distribution.

Evidence of the overall distribution of the Marginidae is very meagre, and it is hoped that it will prove to be much wider than that indicated by the only two known spot localities in Zimbabwe and Madagascar. There remains the possibility that, perhaps as with the rarely collected Mormotomyiidae (Oldroyd 1964: 183–184) and Eurychoromyiidae (J. McAlpine 1968), the Marginidae are among the dipterous families most at risk of extinction.

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